What is claimed is:

1. A method for constructing a composite response surface based on neural networks and selected functions, the method comprising:

(1) providing a set of h initial parameters that determine variation of provided data for a target variable, where each parameter corresponds to a coordinate in an h-dimensional parameter space G;

(2) providing a decomposition of the h parameters into a first set of s simple parameters f_i, numbered $i = 1, \dots, s$, that may be used to describe the provided data with polynomials of total degree no greater than a selected number M_s, and a second set of c complex parameters g_j, numbered $j = 1, \dots, c$, that may be used to describe the provided data using neural networks, and with $s + c = h$, where s, c and M_s are selected positive integers;

(3) providing a simplex, having s+1 vertices, numbered $k = 1, \dots, s+1$, and centered at a selected point in the space G;

(4) applying a neural network for each of the s+1 vertices, and training each of the s+1 neural networks, using selected simulation data obtained by varying the parameters g_j to generate a first sequence of network functions $R_k(g_1, \dots, g_c)$;

(5) providing a second sequence of shape functions $P_k(f_1, \dots, f_s)$ that satisfy the conditions $P_k(f_1, \dots, f_s) = 1$ at the vertex numbered k and $P_k(f_1, \dots, f_s) = 0$ at any vertex other than vertex number k, and $\Sigma P_k(f_1, \dots, f_s) = 1$ for all values of $f_1, \dots, f_s$; and

(6) forming a composite function $CRS(f_i, g_j)$ defined by

$$CRS\{f_i, g_j\} = \sum_{k=1}^{s+1} P_k(f_1, \dots, f_s) \cdot R_k(g_1, \dots, g_c).$$

2. The method of claim 1, further comprising selecting said set of complex parameters to include at least one polynomial in said complex parameters g_j having a selected degree M_c satisfying $M_c > M_s$.

3. The method of claim 1, further comprising choosing said integer M_s from the group of integers consisting of 1, 2 and 3.

4. The method of claim 1, further comprising selecting said set of complex parameters to include any of said h parameters that does not qualify as a simple parameter.

5. The method of claim 1, further comprising:

(7) providing an objective function $OBJ(f_k,g_j)_n$, dependent upon at least one of the parameter values $f_1, \ldots, f_s, g_1, \ldots, g_c$, for the composite function $CRS\{f_k,g_j\}$ at each of N selected locations in G space, numbered $n = 1, \ldots, N$, associated with the target variable, and providing a corresponding objective function value OBJ_n for the target variable at each of the N selected locations, where n is a selected positive integer;

(8) computing a training error value $TE\{g_j,\}$ as a non-negative weighted sum of functions of differences $F_n(OBJ_n - OBJ(f_k,g_j)_n)$, where each function F_n is monotonically increasing in a magnitude of the function argument and has a value 0 where the function argument is 0;

(9) when the training error value $TE\{g_j\}$ is greater than a selected threshold error value ε, providing at least one of a modified set of shape functions $P_k(f_1, \ldots, f_s)$, and returning to step (6); and

(10) when the training error $TE\{g_j\}$ is no greater than the threshold error value ε, accepting the present composite response surface.

6. The method of claim 1, further comprising applying said composite response surface to optimization of a design of a physical object.

7. The method of claim 6, further comprising choosing said physical object to be a shape for an aircraft component.

8. The method of claim 1, further comprising applying said composite response surface to modeling of a response to a process.

9. The method of claim 1, further comprising applying said composite response surface to modeling response of a physical object.